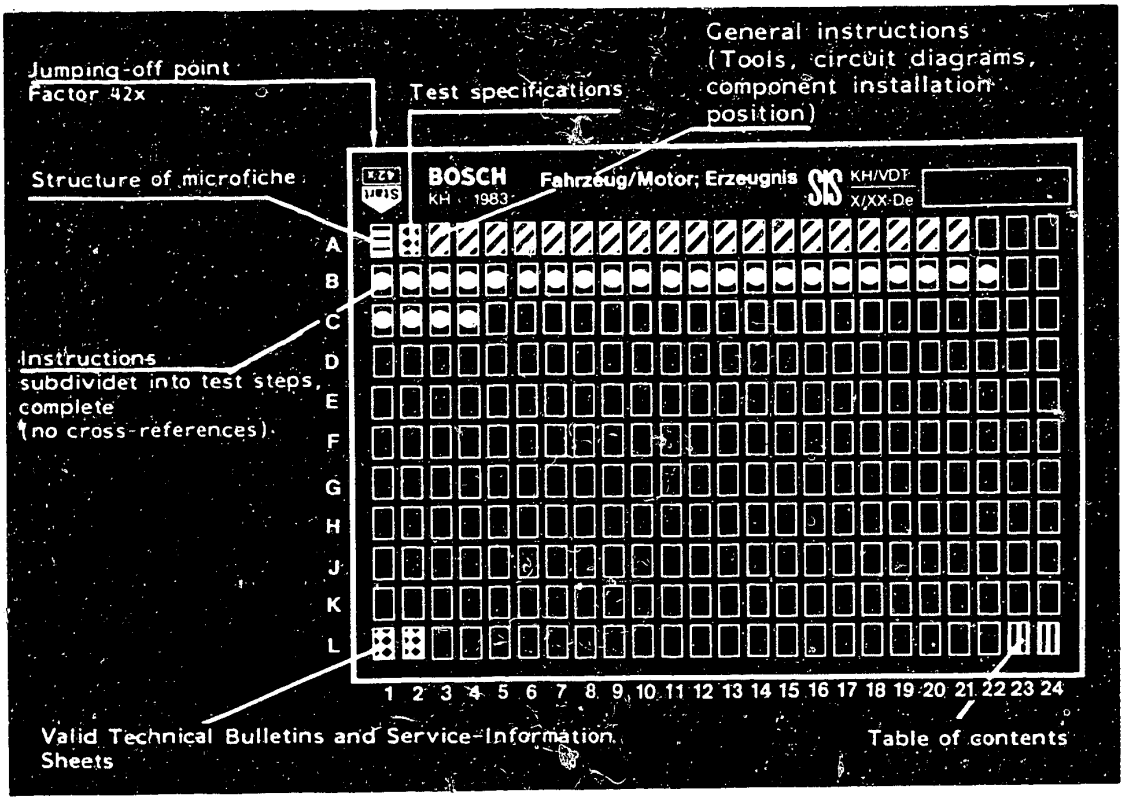
Structure of microfiche



1. Read from left to right

2. Title of microfiche (appears on each coordinate)

E 16	Product/assembly/test step Vehicle/engine	

Coordinate

3. Limits of section

Beginning | Mid-section | End | One-page section

4. References to relevant test steps in test specifications; coordinate e.g. C6

C 6

1. Test specifications:

Resistance:

Pulse generator

Laverda	500	with	
	1000	single	210 ... 230 Ω
	1200	generator	
	1200	with armature base plate	60 ... 80 Ω

Air gap: 0.2 ...0.3 mm

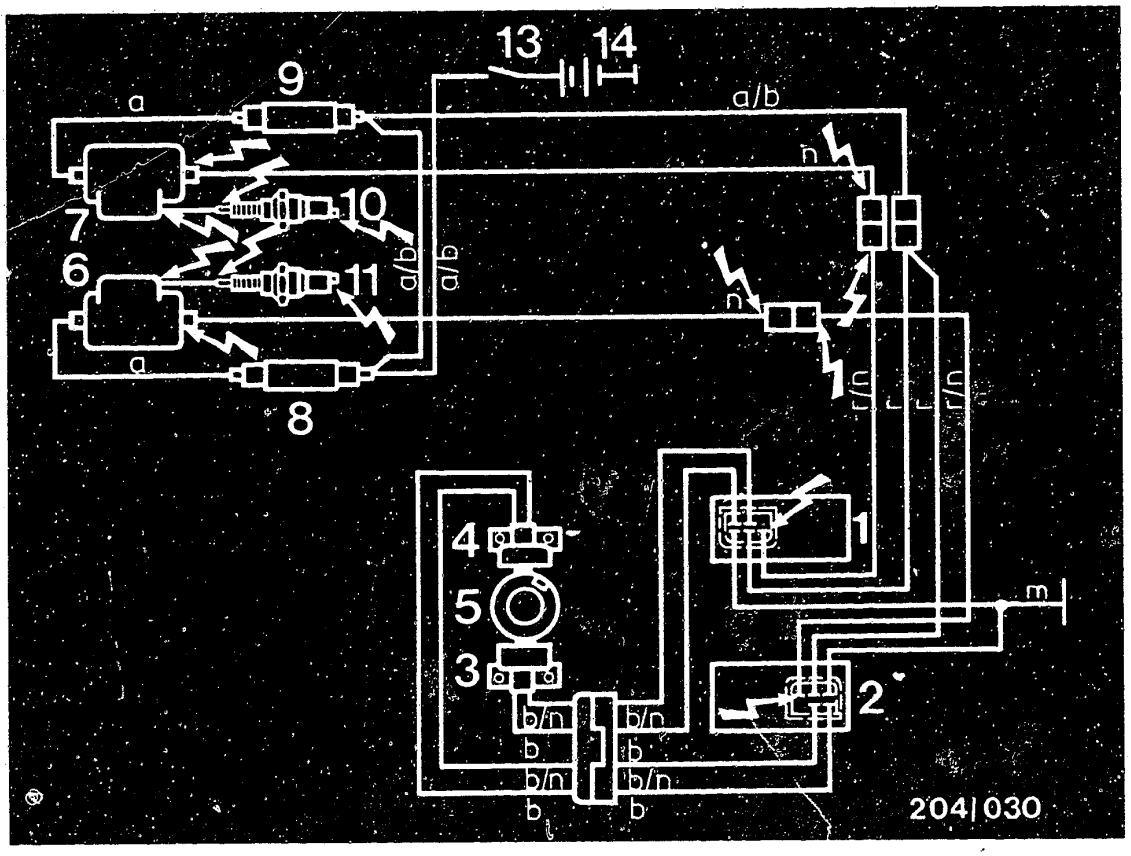
Current consumption of ignition coil: 2.5 ... 4.0 A

Initial ignition-timing adjustment:

Laverda 500	at 3000 min^{-1}	35° BTDC
1000 Jota 1200 TS	3900 ... 4100 min^{-1}	32° BTDC
1200	5000 min^{-1}	33° BTDC

Jump advance:

at 1500 ... 2500 min^{-1}	15° ... 20°



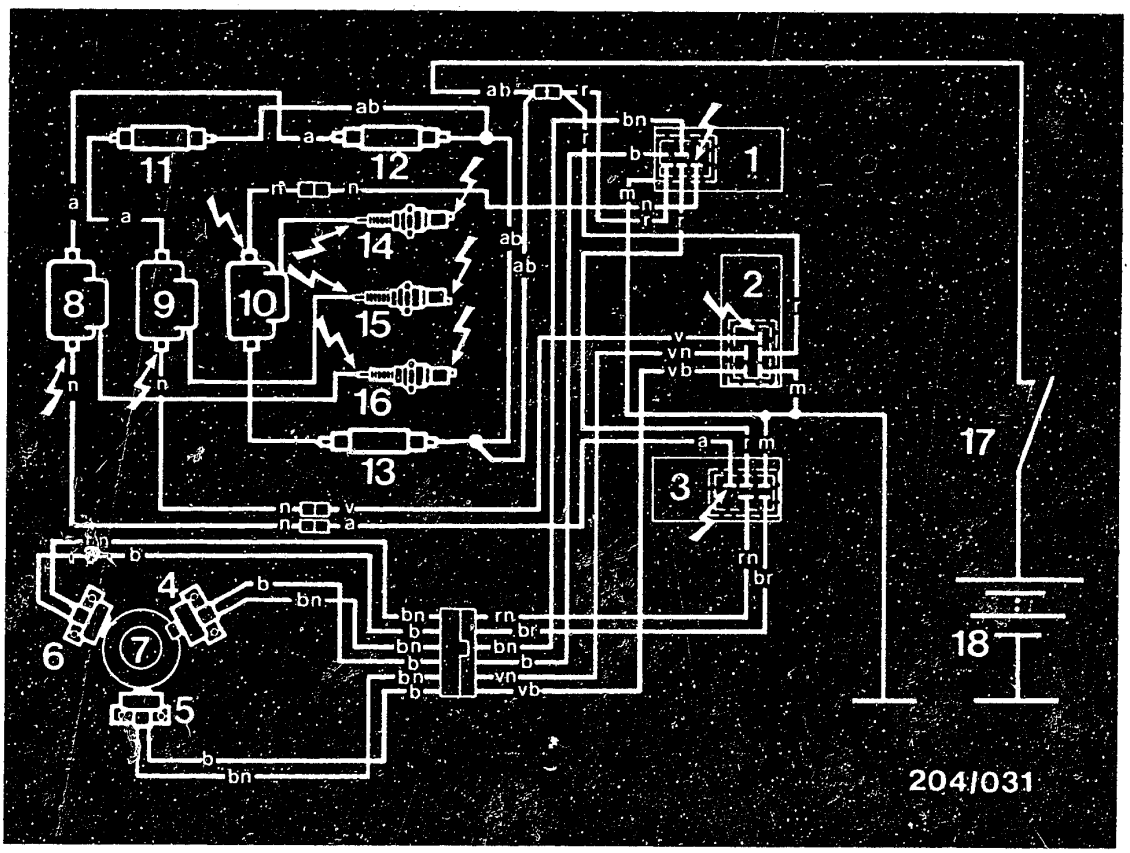
1 = Black box - right-hand cylinder
2 = Black box - left-hand cylinder
3 = Pulse generator for right-hand cylinder
4 = Pulse generator for left-hand cylinder
5 = Control bushing
6 = Ignition coil - left-hand cylinder
7 = Ignition coil - right-hand cylinder
8 = Resistor 0.9 Ω
9 = Resistor 0.9 Ω
10 = Spark plug - right-hand cylinder
11 = Spark plug - left-hand cylinder
13 = Ignition switch
14 = Battery

a = orange
b = white
n = black
r = red
m = brown

ϟ = dangerous voltages (400 V - 25 kV)

2. Terminal diagrams

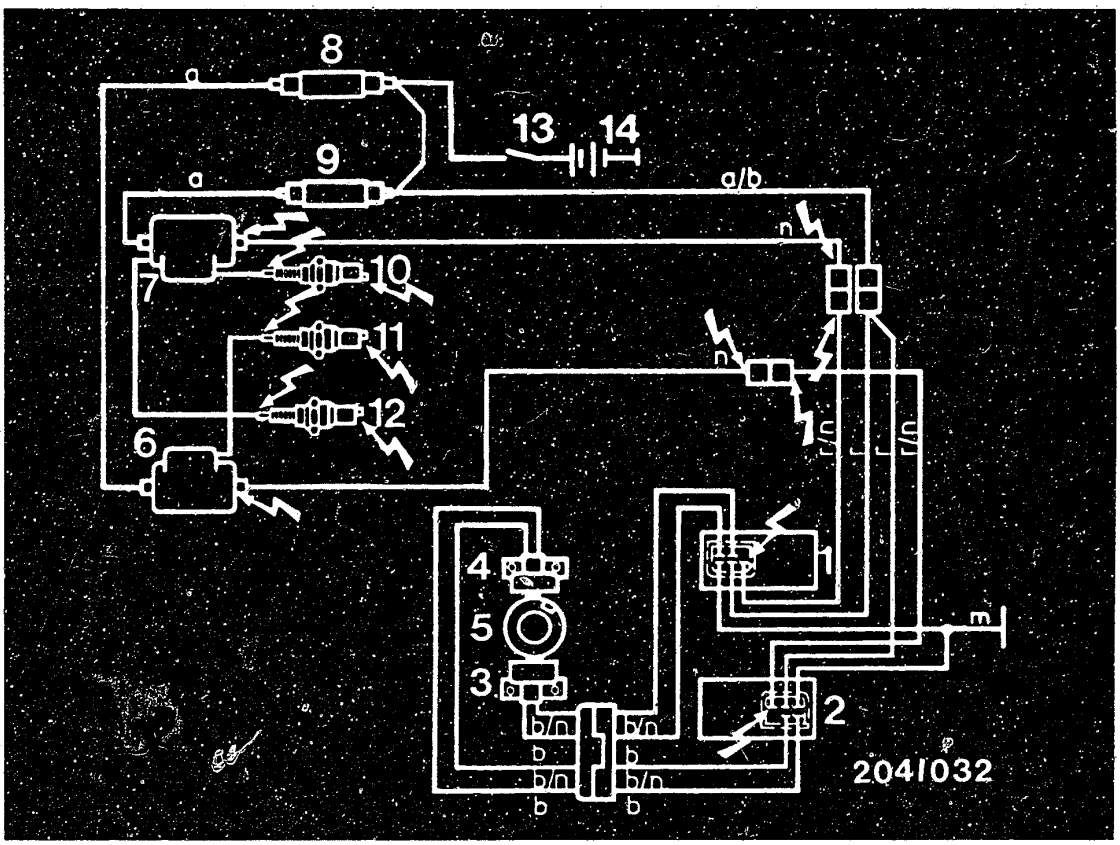
2.1 Terminal diagram - Laverda 500 2 cylinder, with battery semiconductor ignition, 180° pulse generator configuration



1,2,3	=Black box	17	=Ignition switch
4,5,6	=Pulse generator	18	=Battery
7	=Control bushing	↯	=dangerous voltages (400 V - 25 kV)
8,9,10	=Ignition coils		
11,12,13	=Resistors 0.9 Ω		
14,15,16	=Spark plugs		

a = orange b = white n = black v = green m = brown
r = red

2.2 Terminal diagram - Laverda 1000 Jota 3 cylinder, with battery semiconductor ignition, 120° pulse generator configuration

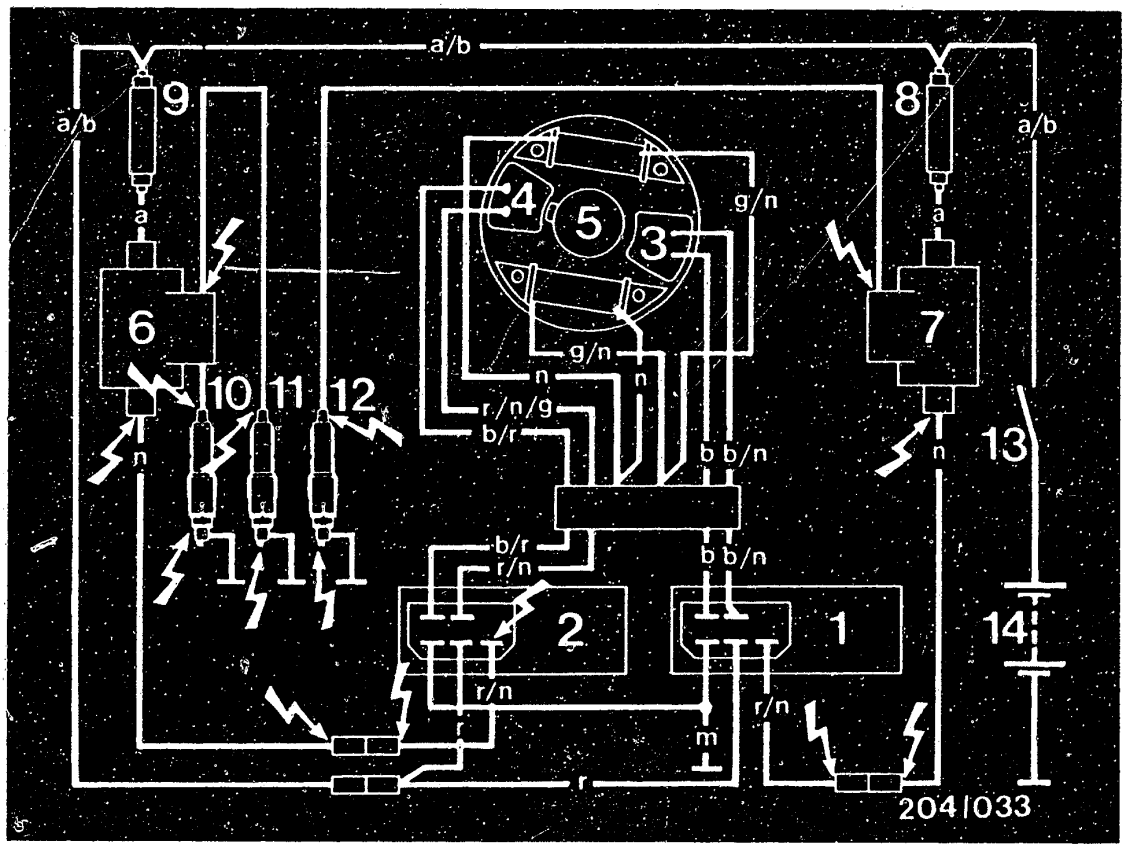


1=Black box - RH + LH cylinders
2=Black box - center cylinder
3=Pulse generator for RH + LH cylinders
4=Pulse generator for center cylinder
5=Control bushing
6=Ignition coil - center cylinder
7=Ignition coil for RH + LH cylinders (double-spark ignition coil)
8=Resistor 0.9 Ω
9=Resistor 0.9 Ω
10=Spark plug - RH cylinder
11=Spark plug - center cylinder
12=Spark plug - LH cylinder
13=Ignition switch
14=Battery

a = orange
b = white
n = black
r = red
m = brown

= dangerous voltages (400 V - 25 kV)

2.3 Terminal diagram - Laverda 1200 3 cylinder with battery semiconductor ignition, 180° pulse generator configuration



1 = Black box 1
2 = Black box 2
3 = Pulse generator 1
4 = Pulse generator 2
5 = Control bushing
6 = Ignition coil 1
7 = Ignition coil 2
8 = Resistor 0.9 Ω
9 = Resistor 0.9 Ω
10 = Spark plug 1
11 = Spark plug 2
12 = Spark plug 3
13 = Ignition switch
14 = Battery
a = orange
b = white
n = black
r = red
m = brown
g = yellow

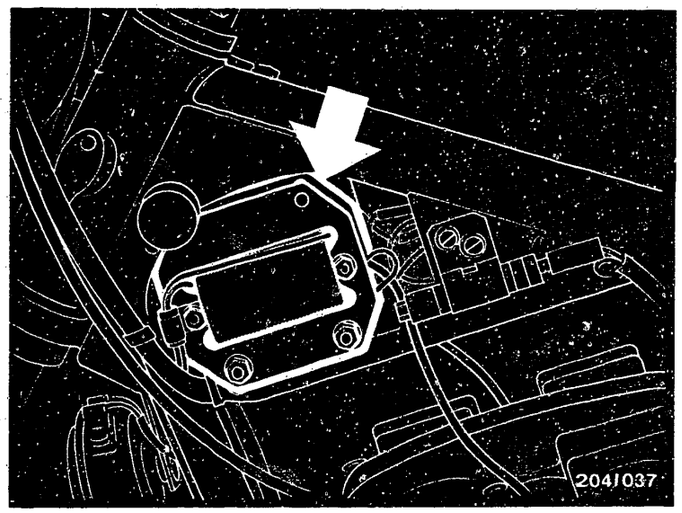
= dangerous voltages (400 V - 25 kV)

2.4 Terminal diagram - Laverda 1200 3 cylinder with battery semiconductor ignition, 180° pulse generator configuration on armature base plate

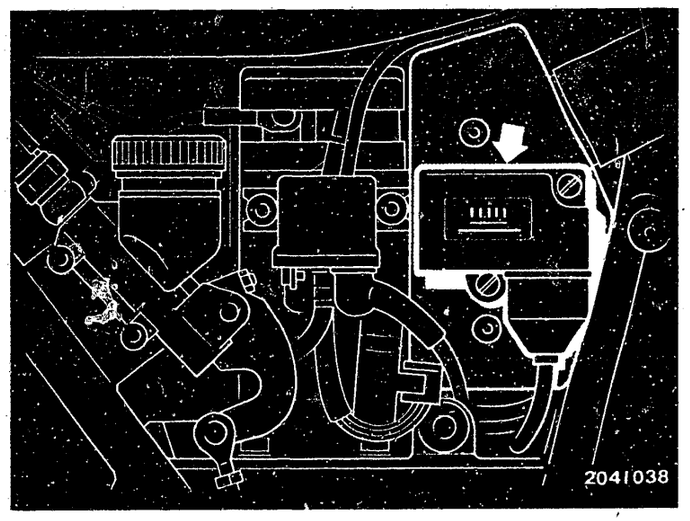
3. Installation position of components

3.1 Laverda 500, 180° pulse generator configuration

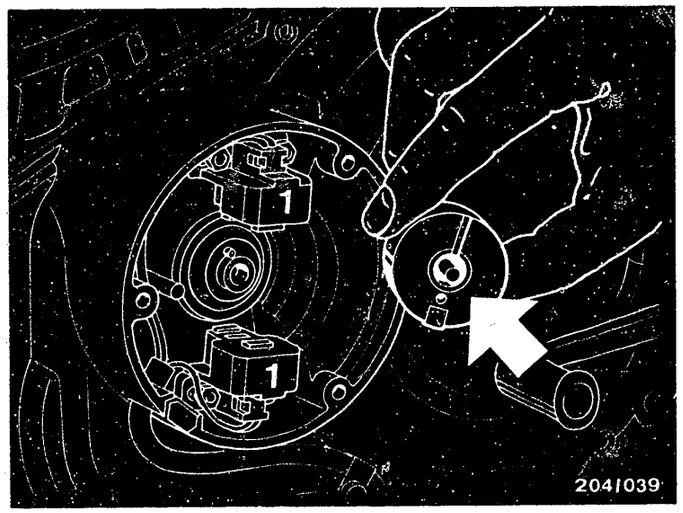
Ignition coils are mounted by the iron core with 2 through-screws under the fuel tank (arrow, top picture).



Both black boxes are mounted near the air filter (arrow, center picture).

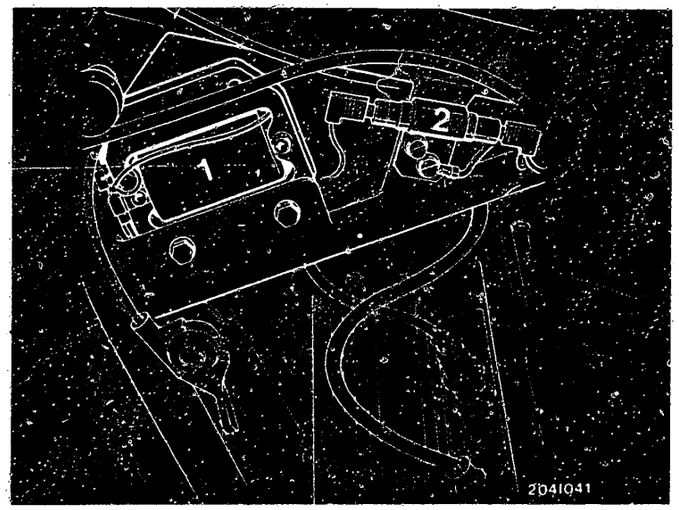


Pulse generators (1) and control bushing (arrow) are housed in the left-hand crankshaft housing (bottom picture).
The control bushing is mounted on the end of the crankshaft and is held in position by a locating pin.
The control bushing is usually a part made by the engine manufacturer.

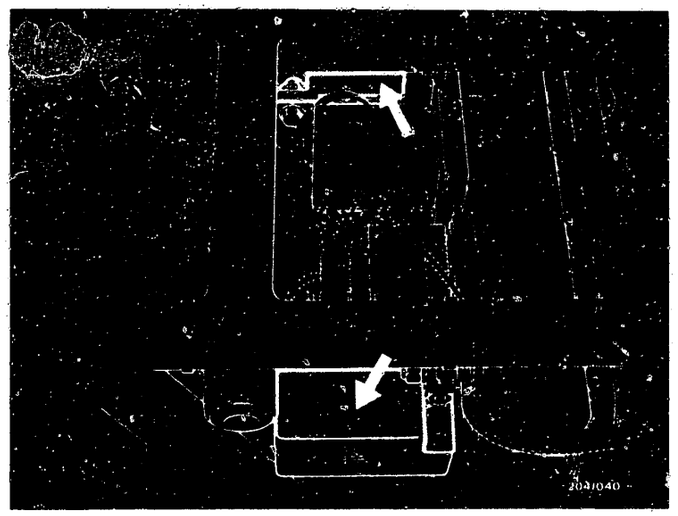


3.2 Laverda 1000 Jota and 1200 TS/Mirage, 180° Pulse Generator Configuration

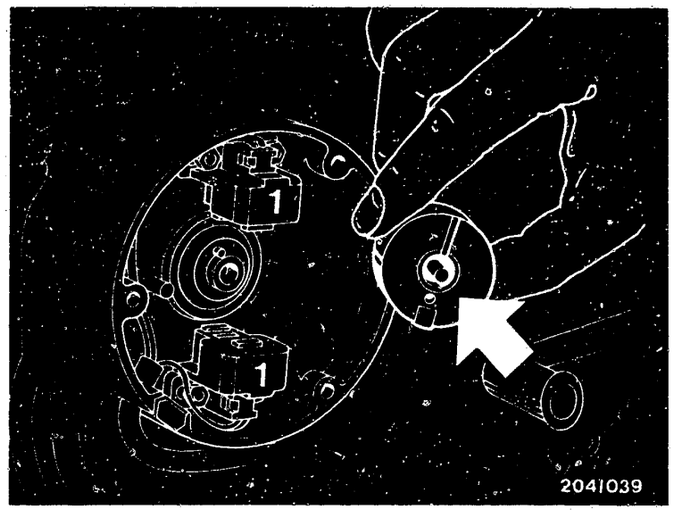
Ignition coils (1) and resistors (2) are mounted on the vehicle frame under the fuel tank to left and right (top picture).



Two black boxes are mounted to left and right of the battery (arrow, center picture).

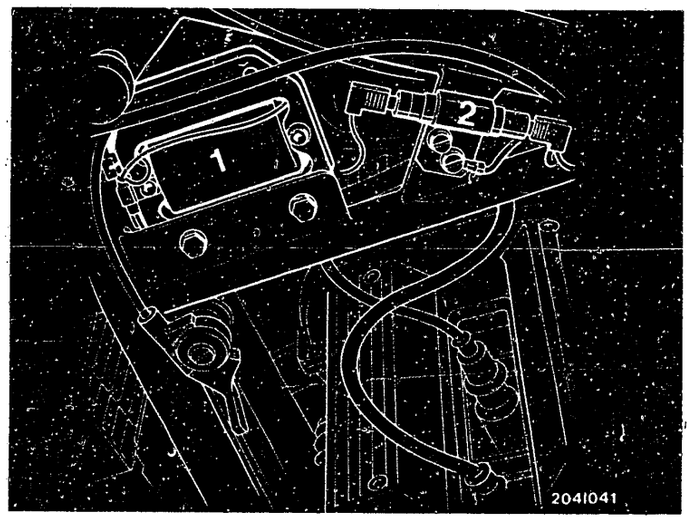


Pulse generators (1) and control bushing (arrow) are housed in the left-hand crankshaft housing (bottom picture).
The control bushing is mounted on the end of the crankshaft and is held in position by a locating pin.
The control bushing is usually a part made by the engine manufacturer.

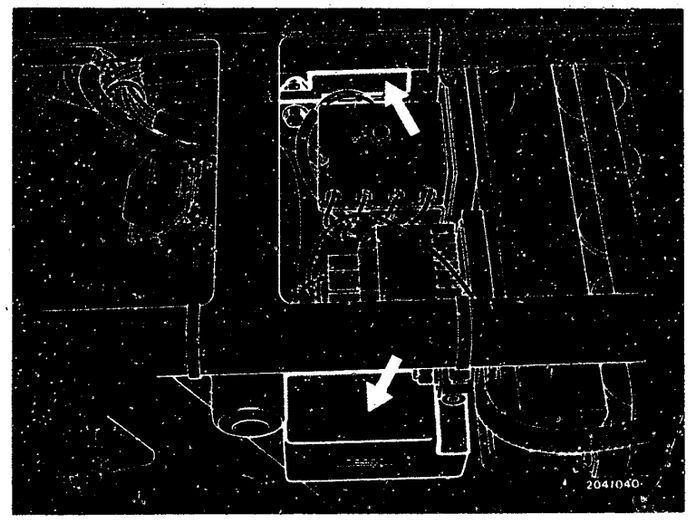


3.3 Laverda 1000/3CI and 1200 180° Pulse Generator Configuration on Armature Base Plate

Ignition coils (1) (one single-spark ignition coil, one double-spark ignition coil) and resistors (2) are mounted on the vehicle frame under the fuel tank to left and right (top picture).

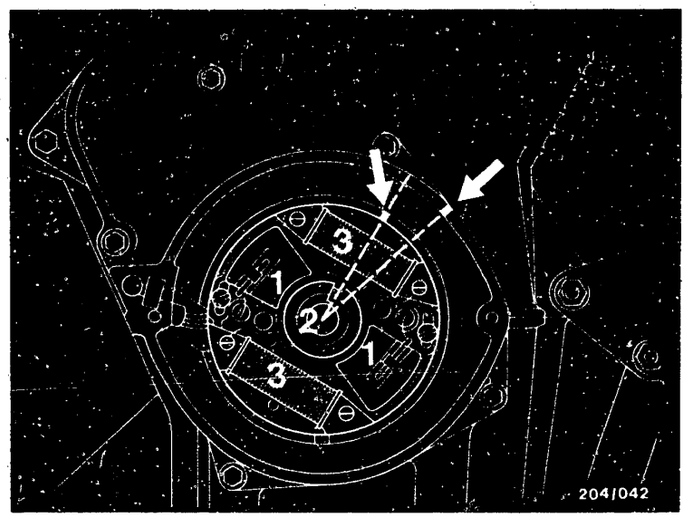


Two black boxes are mounted to left and right of the battery (arrow, center picture).



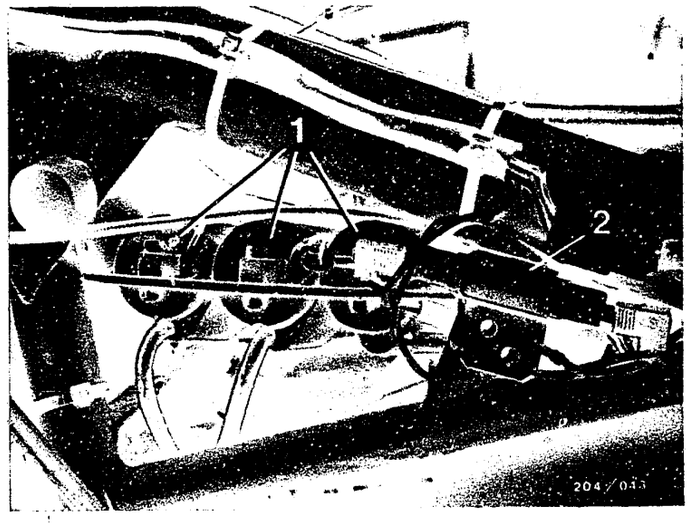
Armature base plate with pulse generators (1) and light coils (3) and control bushing (2) are housed in the right-hand crankshaft housing.
Control bushing (2) is located on crankshaft with headless setscrew. When installing the armature base plate, marks on armature base plate and housing must be in alignment (arrows, bottom picture).

1 = Pulse generator
2 = Control bushing
3 = Light coils

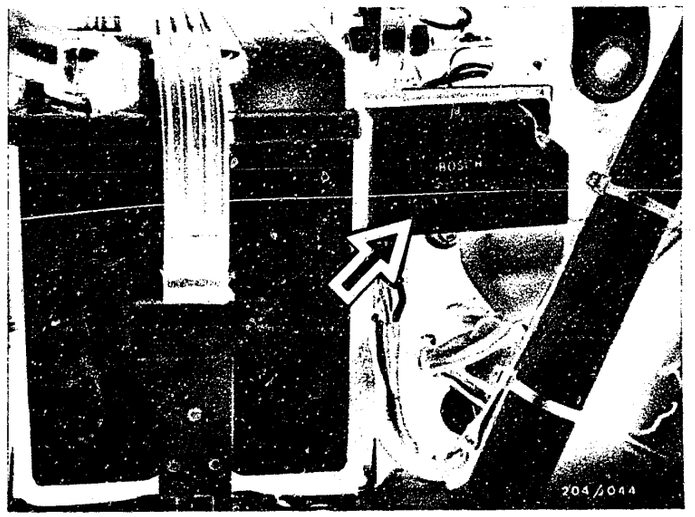


3.4 Laverda 1000 Jota, 1000 RGS and 1200, 120° Pulse Generator Configuration

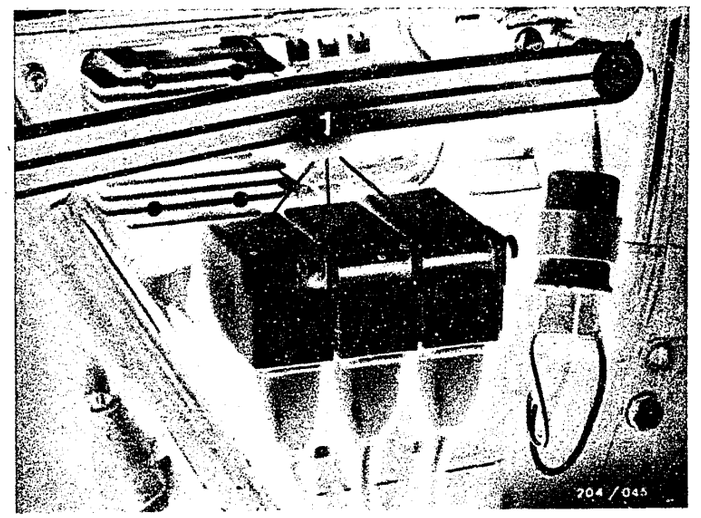
Ignition coils (1) and resistors (2) are mounted on the frame under the fuel tank (bottom picture).

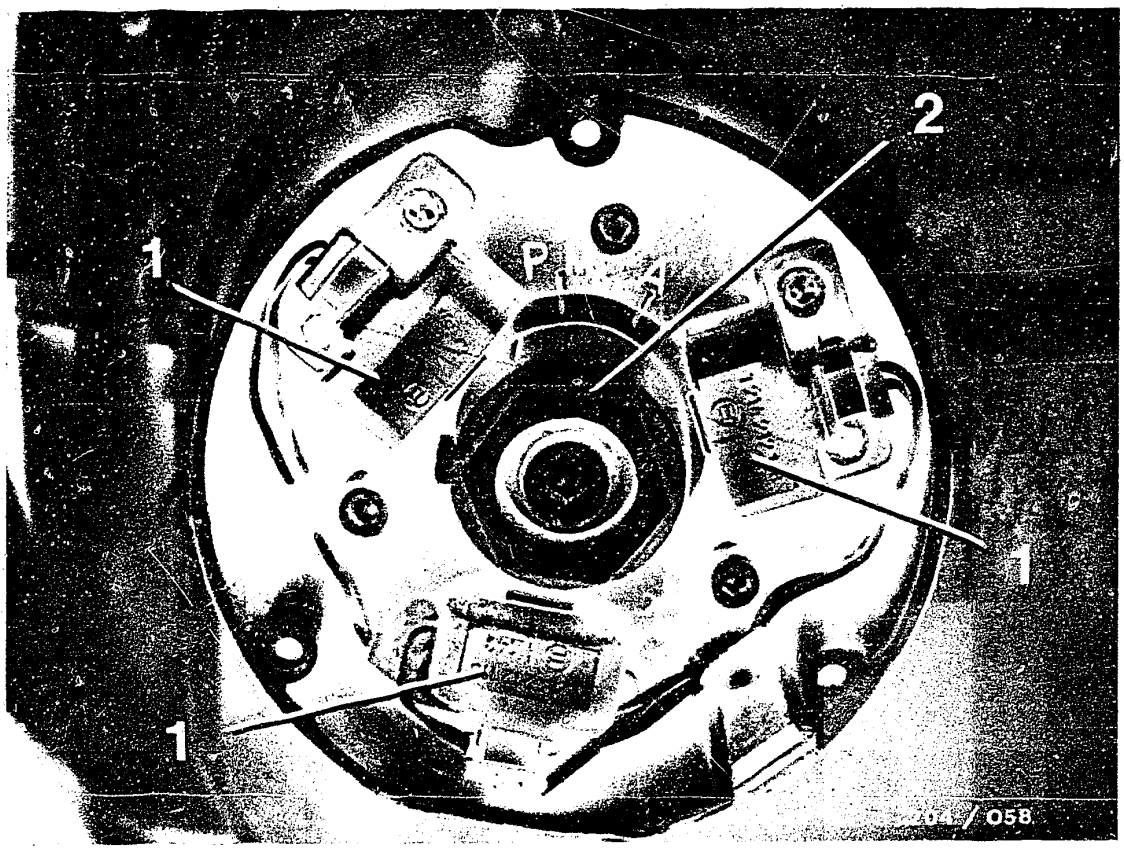


On the 1000 Jota the three black boxes (arrow) are mounted to left and right of the battery and behind it (under seat) (center picture).



On the 1000 RGS and 1200 the black boxes (1) are mounted on the right in the angle of the frame (bottom picture).





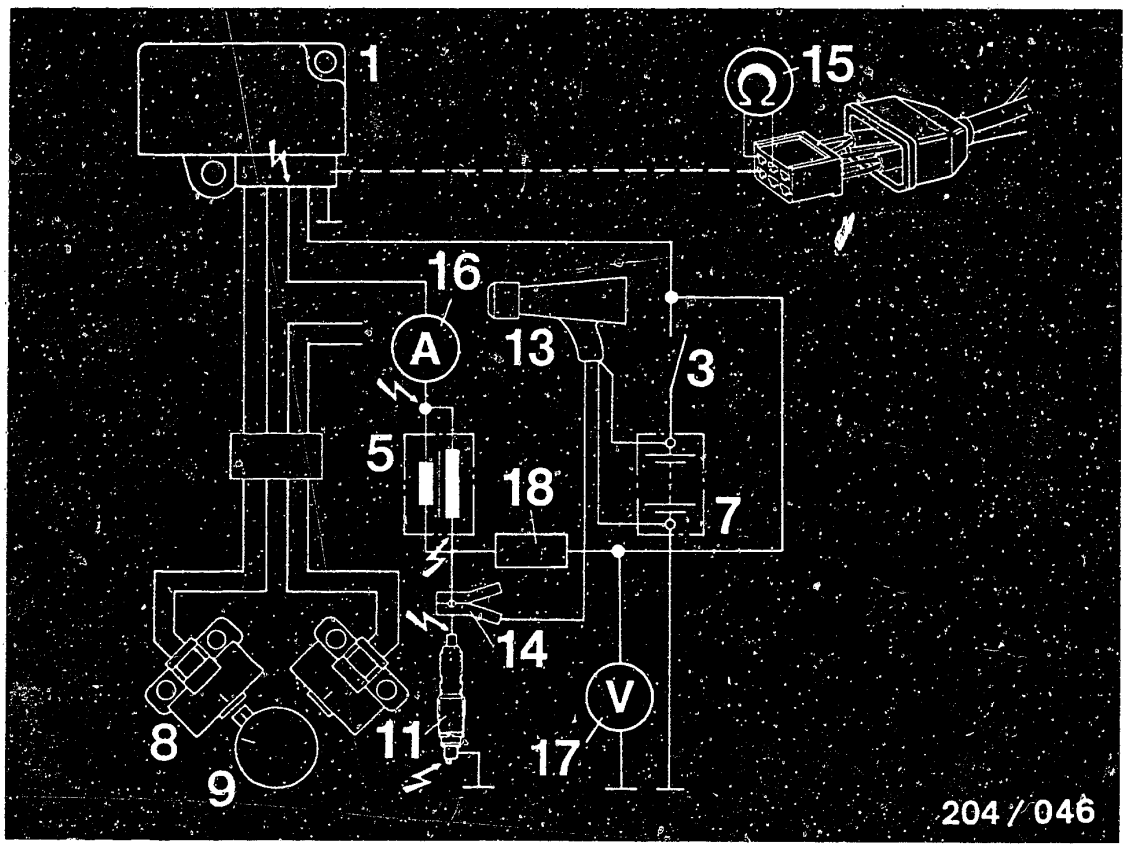
1 = Pulse generator

2 = Control bushing with trigger projection

The pulse generators are arranged in a 120° configuration on the right-hand side (as viewed in the forward direction of travel) in the crankshaft housing.

4. Necessary Test Equipment

Timing light	e.g. ETZ 003	0 684 100 300
or	ETZ 005	0 684 100 500
Pocket motortester	e.g. KTE 001.00	0 684 400 100
Electrics tester	e.g. ETE 014.00	0 684 101 400
Motortester	e.g. MOT 300	0 684 000 300
Feeler gauge	e.g. KDZV 7399	

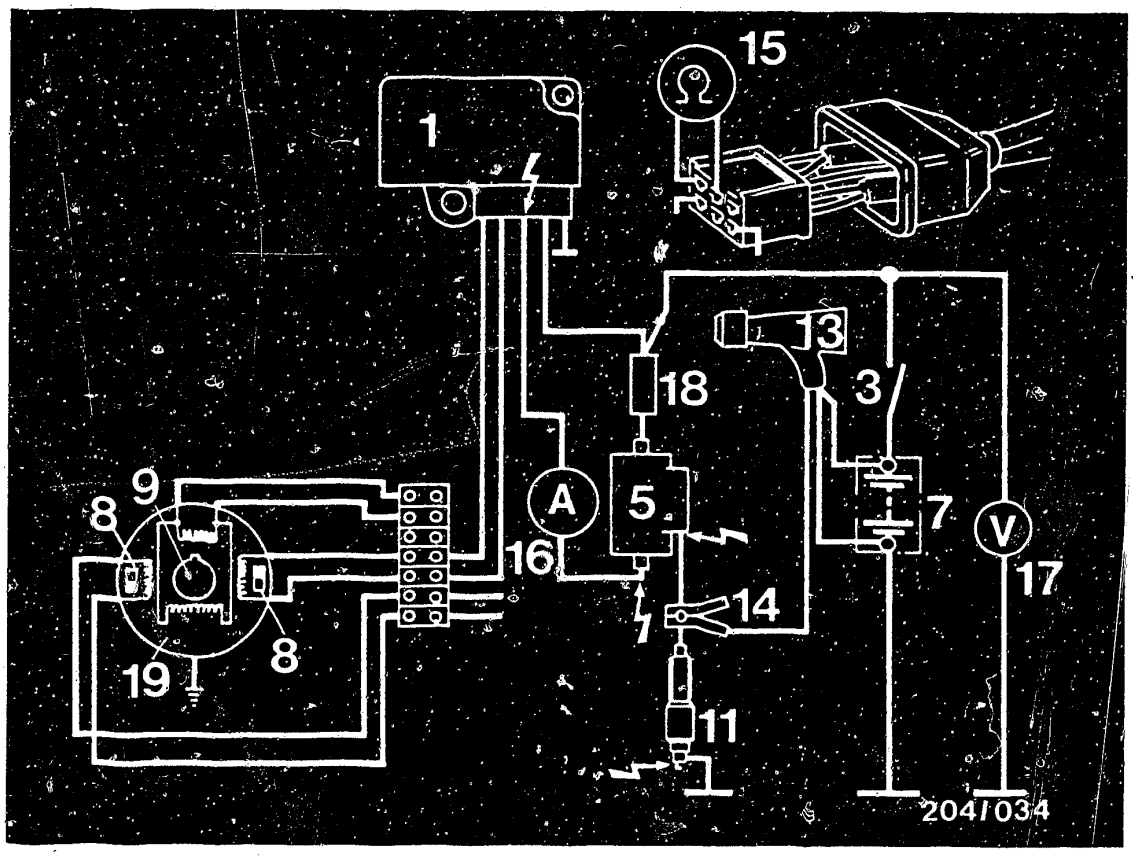


1 = Black box RH
3 = Ignition switch
5 = Ignition coil RH
7 = Battery
8 = Pulse generator RH
9 = Control bushing
11 = Spark plug RH
13 = Timing light
14 = Clamp-on pickup
15 = Ohmmeter
16 = Ammeter
17 = Voltmeter
18 = Resistor 0.9 Ω
⚡ = dangerous voltages (400 V - 25 kV)

5. Connecting the Test Equipment

Connect the test equipment according to the operating instructions.
Note: Various testers indicate only half the engine speed.

5.1 Connecting the Test Equipment in the Case of Battery Semiconductor Ignition with Single Pulse Generator



1 = Black box
3 = Ignition switch
5 = Ignition coil
7 = Battery
8 = Pulse generator
9 = Control bushing
11 = Spark plug
13 = Timing light
14 = Clamp-on pickup
15 = Ohmmeter
16 = Ammeter
17 = Voltmeter
18 = Resistor 0.9 Ω
19 = Armature base plate
⚡ = dangerous voltages (400 V - 25 kV)

5.2 Connecting the Test Equipment in the Case of Battery Semiconductor Ignition with Armature Base Plate

6. Danger of Accident on Electronic Ignition Systems

Increased demands of modern engines on the ignition system combined with the desire for freedom of maintenance have recently led to electronic ignition systems being fitted as standard. Usually the ignition power of electronic systems (of almost all manufacturers) is higher than that of conventional systems, and there are signs of further increases in power. Electronic ignition systems thus reach a power range which can be highly dangerous if live parts or terminals are touched (both on the primary as well as on the secondary sides).

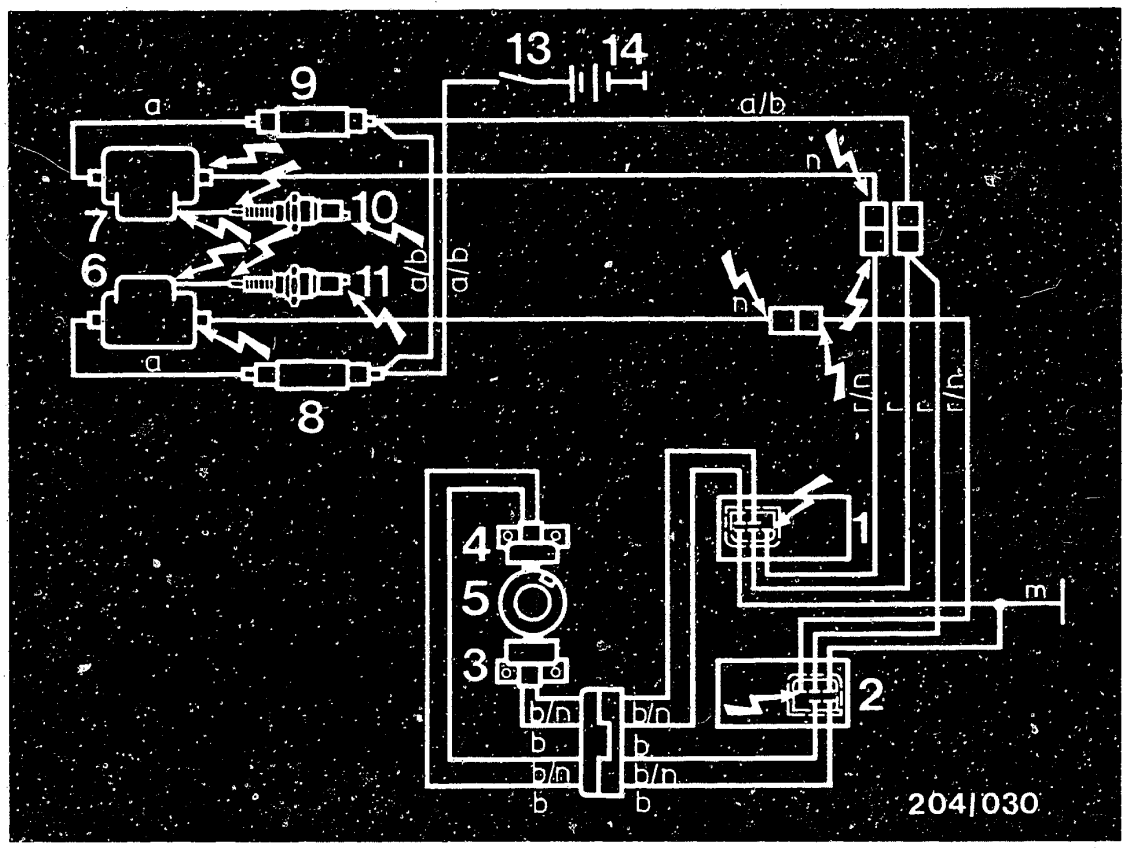
In this connection we should like to point out that the VDE regulations, in particular VDE 0104/7.67 and/or the respective national regulations must be followed when testing or working on the ignition system.

The ignition should always be switched off when working on the ignition system (switch off ignition or voltage source). Such work includes:

- Connecting of engine test equipment (timing light, dwell-tach tester, ignition oscilloscope etc.).
- Replacing parts of the ignition system (spark plug, ignition coil, H.T. ignition cable etc.).

If, while testing the ignition system or during adjustment work on the engine (e.g. carburettor), it becomes necessary to switch on the ignition (switch on ignition or voltage source), the above-mentioned dangerous voltages occur over the entire system.

The danger of accident exists, therefore, not only on the individual assemblies of the ignition system (e.g. ignition distributor, ignition coil, trigger box, ignition harness), but also on the wiring harness (e.g. tachometer connection, diagnostic plug), at plug-in connections and test equipment.



1 = Black box - right-hand cylinder
2 = Black box - left-hand cylinder
3 = Pulse generator for right-hand cylinder
4 = Pulse generator for left-hand cylinder
5 = Control bushing
6 = Ignition coil - left-hand cylinder
7 = Ignition coil - right-hand cylinder
8 = Resistor 0.9 Ω
9 = Resistor 0.9 Ω
10 = Spark plug - right-hand cylinder
11 = Spark plug - left-hand cylinder
13 = Ignition = switch
14 = Battery
a = orange
b = white
n = black
r = red
m = brown

⚡ = dangerous voltages (400 V - 25 kV)

Electrical terminal diagram

The dangerous locations are identified by danger arrows taking the example of the terminal diagram of an electronic ignition system.

7. Trouble-shooting

For the experienced expert direct trouble-shooting begins with the trouble-shooting chart according to customer complaints (fault symptoms) on Coordinate B2.

The possible cause should be selected from the trouble-shooting chart according to the complaint stated by the customer or which you yourself have determined.

The coordinate at the end of the cause column refers to the appropriate detailed trouble-shooting program with corresponding test specifications.

This is followed by the detailed trouble-shooting program which should be performed in the given order for best results.

7.1 Make sure of the following before testing:

- Check the customer complaint
- Battery fully charged
- Fuel system O.K.
- Engine mechanically O.K. (e.g. compression, valve clearance etc.)
- Minimum cranking speed known
- Starting motor operating

7.2 Trouble-shooting Chart

The symptoms given below may be due to one or more faults.

Customer complaint (fault symptom)

1. Starting motor operates, engine fails to start
2. Rough idling
3. Poor throttle response (flat spot during acceleration)
4. Engine lacks power
5. Misfiring
6. Fuel consumption too high
7. Engine pings when accelerating
8. Backfiring
9. Engine overheats

1	2	3	4	5	6	7	8	9	Cause	Test Instructions	Coordinates
●	●	●	●	●	●		●		Spark plugs defective	Remove spark plug and make visual examination	---
●	●	●	●	●	●	●	●	●	Ignition timing incorrect		C 1
●	●	●	●	●					Shunt on secondary side	Visual examination of pulse generator system, ignition coil, ignition harness and spark plug	B 9
●	●	●	●	●					Open circuit on secondary side	Assessment of pulse generator system, ignition coil, ignition harness and spark plug by means of continuity test with ohmmeter	B 9
●									Open circuit on primary side	Test power supply to black box and/or test primary circuit	B 9

Trouble-shooting Chart (continued)

Customer complaint (fault symptom)

1. Starting motor operates, engine fails to start	2. Rough idling	3. Poor throttle response (flat spot during acceleration)	4. Engine lacks power	5. Misfiring	6. Fuel consumption too high	7. Engine pings when accelerating	8. Backfiring	9. Engine overheats	Cause	Test Instructions	Coordinates
●	●	●	●	●					Ignition coil defective	Visual examination, electrical test	B 9
		●	●	●	●				Interference-suppression resistors defective	Assess by means of resistance measurement	---
					●	●			Jump advance incorrect		C 7
●									Black box defective	Test power supply to black box and/or test pulse generators	B 7

8. Trouble-shooting Program

This program is designed - with the aid of all suitable test equipment - to help workshop employees to quickly detect causes of trouble on two-wheeled vehicles with breakerless ignition system.

Procedure

The trouble-shooting program is divided into 3 rows of boxes.

The left-hand row contains test instructions and test specifications.
The center row contains repair instructions.
The right-hand row contains the illustrations/terminal diagrams belonging to the text and the explanation of the items in the picture.

If the questions asked in the left-hand row can be answered conclusively with "yes", then proceed to the next test down.

If the answer to the question is "no", branch to the center row and carry out the tests given there.

Testing of Ignition Switch
Emergency Switch in Position RUN
Switch O.K.?

no → Replace ignition switch

yes

Test Pulse Generators for continuity (210 ... 230 Ω) and open circuit (top picture)
Pulse generators O.K.?

no → Replace defective pulse generators

yes

Check Pulse Generator System for mechanical damage. Check air gap and crankshaft bearing play according to manufacturer's data

Pulse generator system O.K.?

no → Replace pulse generator system.

Set air gap and crankshaft bearing play according to manufacturer's specification.

yes

Test Pulse Generator Leads to black box.

Pulse generator leads O.K.?

no → Replace defective pulse generators.

yes

Test Battery Voltage at disconnected plug of black box (bottom picture)

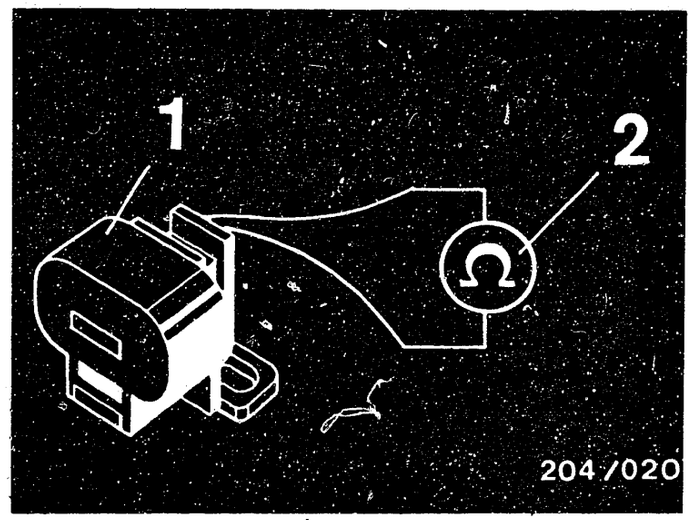
Battery voltage present?

no → Test lead from battery to black box and/or test ground connection.

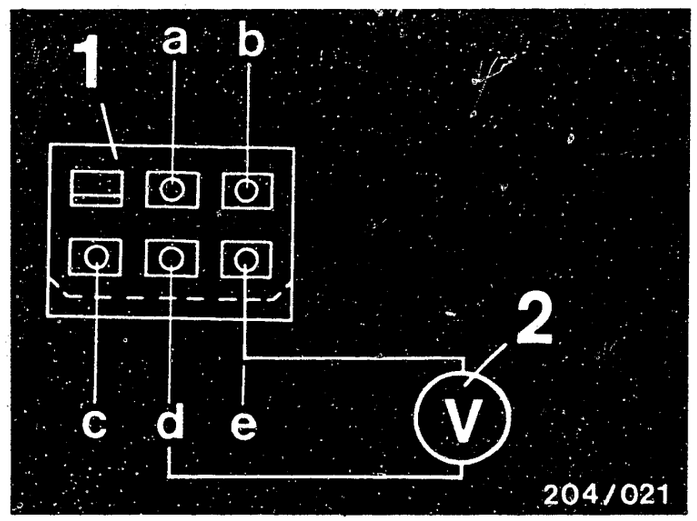
Replace if necessary.

yes

Continued on B9/B10



1 = Pulse generator
2 = Ohmmeter



1 = Top view of plug from rear
2 = Voltmeter
a = white/black (pulse generator, ground)
b = white (pulse generator +)
c = red/black (term. 1)
d = red (term. 15)
e = brown (ground)

yes

Connect ammeter into lead between black box and ignition coil. Switch on ignition and measure current consumption (2.5 ... 4.0 A) with engine stopped (top picture). Current consumption O.K.?

no → If cranking speed sufficient, replace black box.

yes

Testing of leads to ignition coil (Terminals 1 and 15)

Leads O.K.?

no → Replace defective leads.

yes

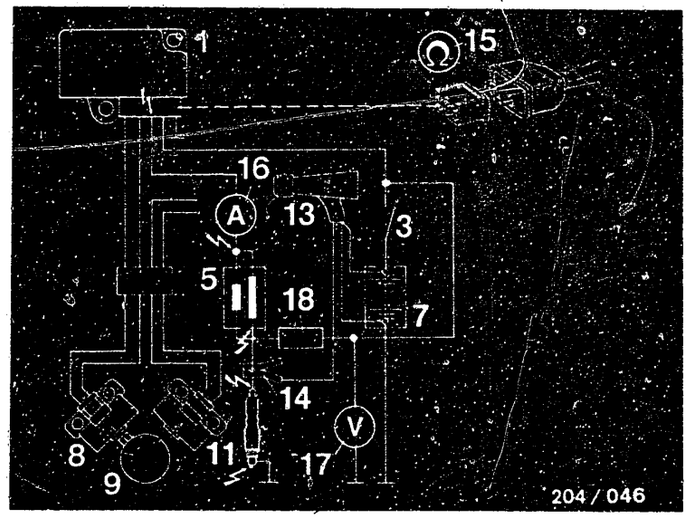
Test lead 4 from ignition coil to spark plug connector.

Lead 4 O.K.?

no → Replace defective lead or make new contact.

yes

Continued on B11/B12



1 = Black box
3 = Ignition switch
5 = Ignition coil
7 = Battery
8 = Pulse generator
9 = Control bushing
11 = Spark plug
13 = Timing light
14 = Clamp-on pickup for timing light
15 = Ohmmeter
16 = Ammeter
17 = Voltmeter
18 = Resistor
⚡ = dangerous voltages (400 V - 25 kV)

yes

Using ohmmeter, test primary and secondary sides of ignition coil for continuity and open circuit (top picture).

Ignition coil O.K.?

no → Replace defective ignition coil

yes

Test spark-plug connectors for open circuit and short circuit to ground using ohmmeter.

Spark-plug connectors O.K.?

no → Replace defective spark-plug connectors

yes

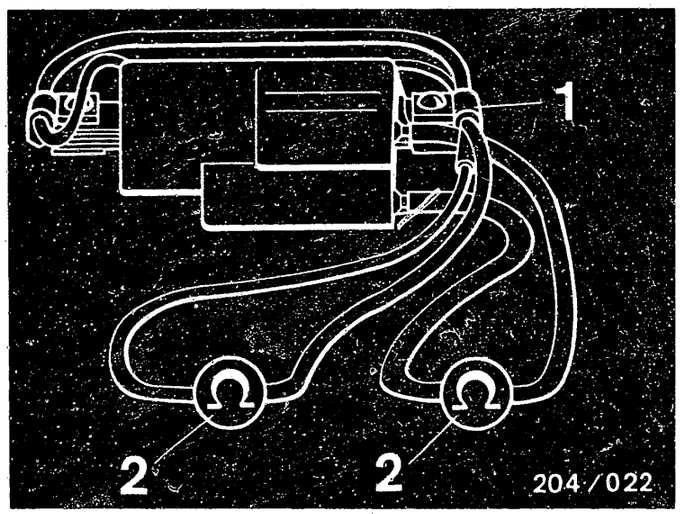
Test spark plugs.

Spark plugs O.K.?

no → Replace defective spark plugs

yes

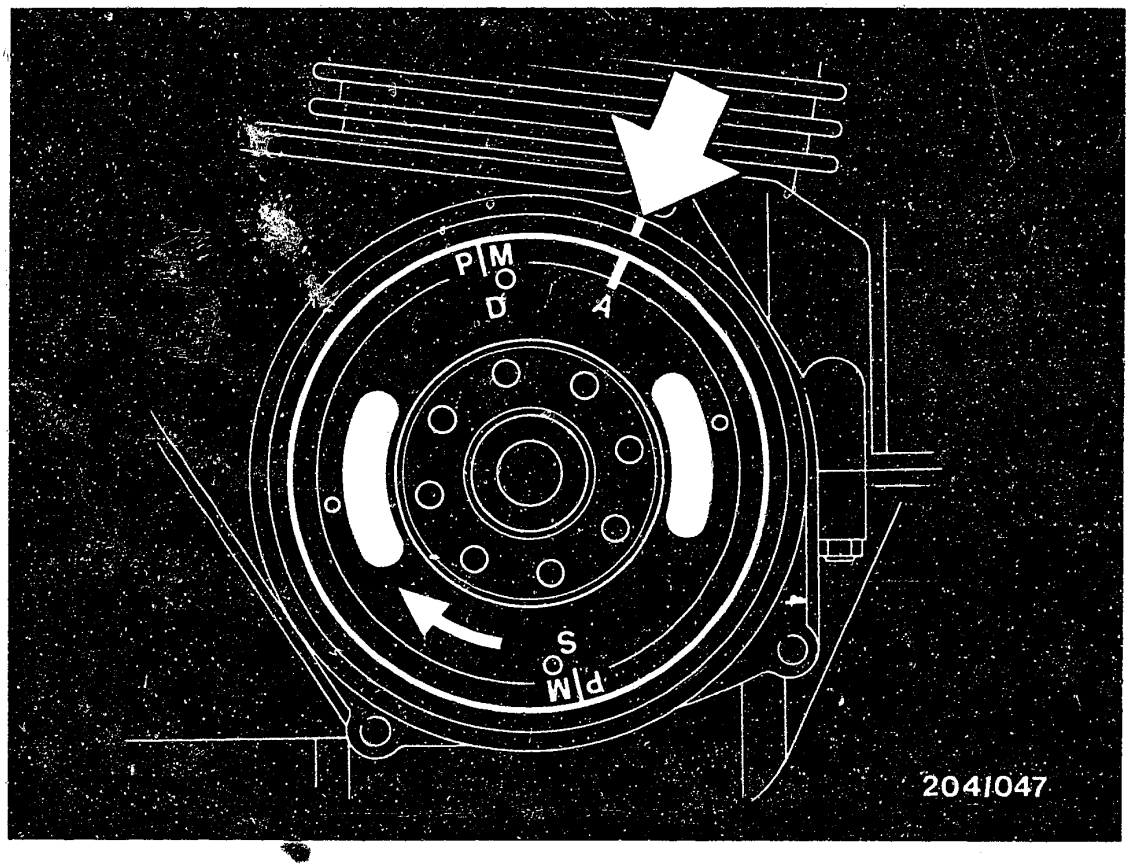
No fault in ignition system



1 = Ignition coil
2 = Ohmmeter

If the timing is advanced below the jump speed given by the manufacturer, widen the air gap at the pulse generator.
If the timing is advanced above the stated jump speed, reduce the air gap at the pulse generator.

- Each time after changing the air gap, check the jump speed and ignition timing once again.



9.2 Testing the ignition timing on Laverda 500

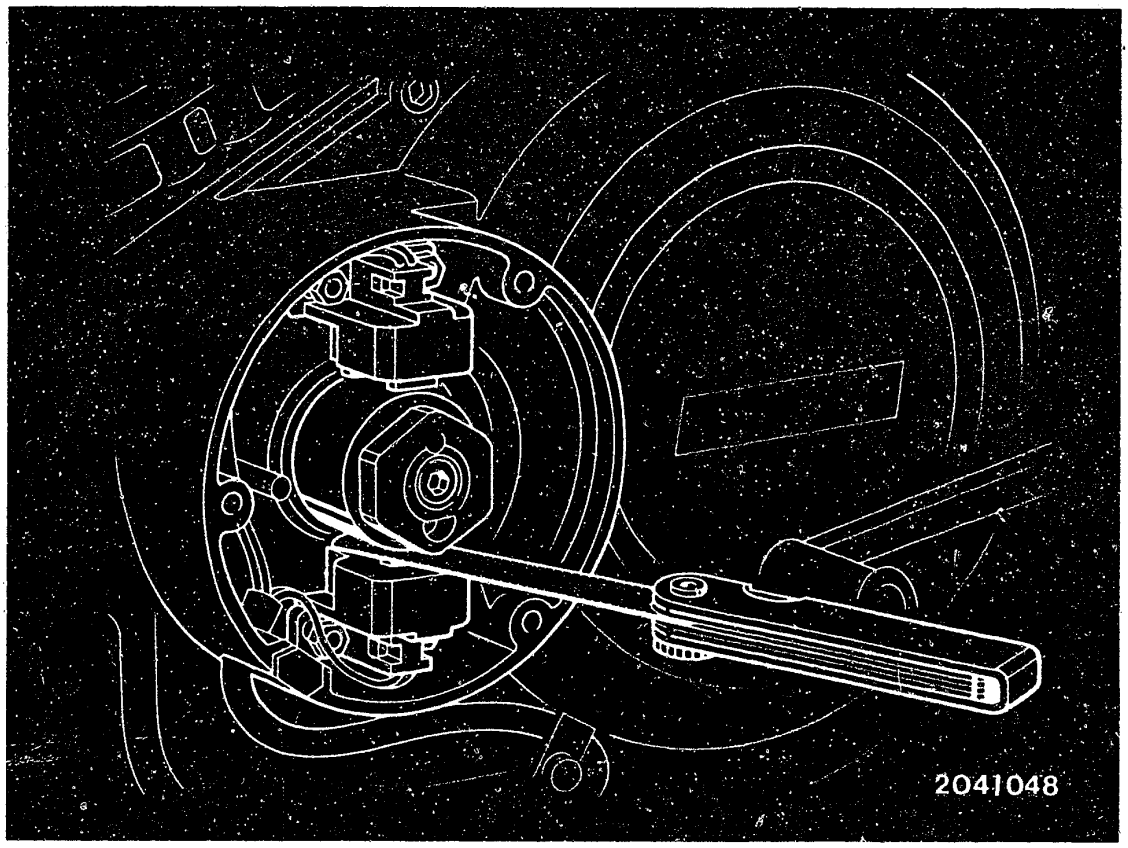
Remove generator cover on right-hand crankshaft housing.

— The generator rotor bears 3 marks: "A" for testing and adjusting the ignition timing, "S" and "D" for testing top dead center.

Connect timing light according to operating instructions and fit clamp-on pickup over one of the H.T. ignition cables.

Start engine and aim timing light at mark "A".

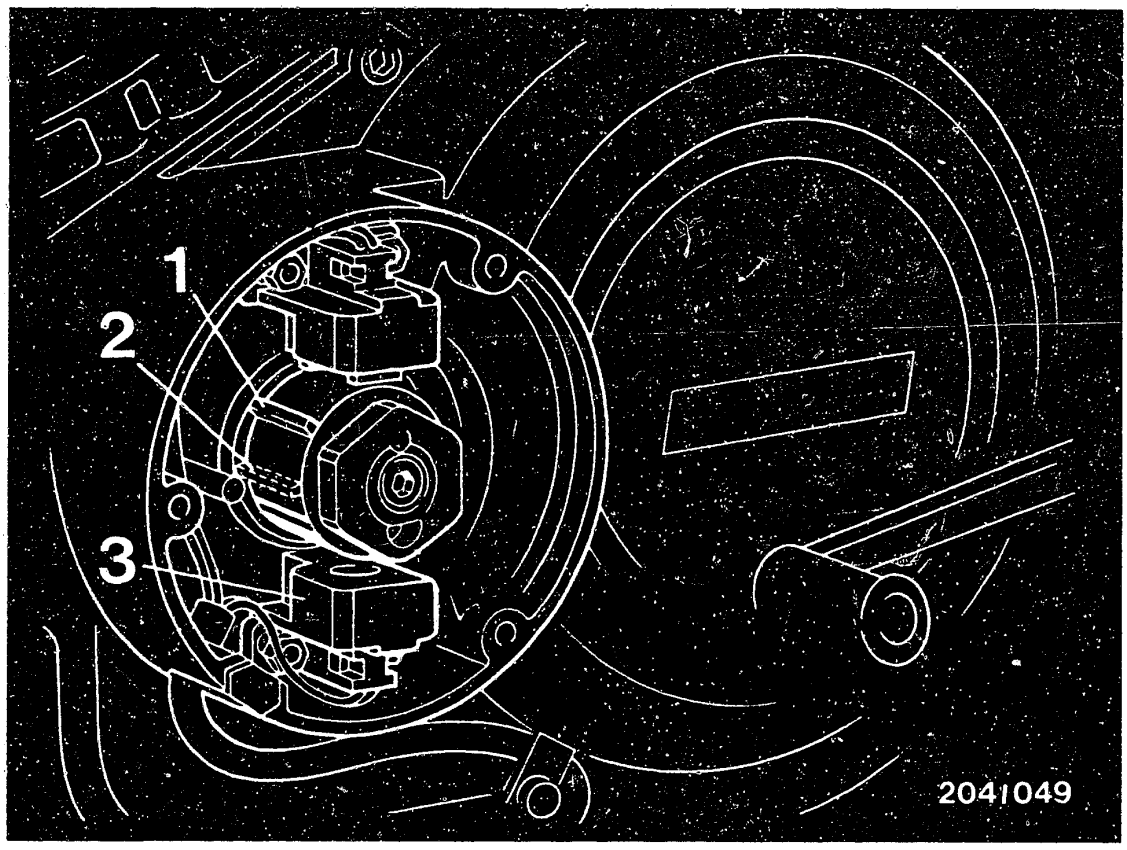
If at a speed of 3000 min^{-1} the moving mark "A" agrees with the fixed mark on the housing, the ignition timing is correct. If mark "A" is to the left of it, there is too much advance, and if it is to the right of it, there is too much retard. Test the ignition timing separately for each cylinder.



9.3 Adjusting the ignition timing on Laverda 500

Remove left-hand crankshaft housing cover.
Each adjusting of the ignition timing must be accompanied by a re-adjusting of the air gap between pulse generators and control bushing. This is done after loosening the fastening screws by moving the pulse generators toward the crankshaft or away from it. The air gap should be 0.1 ... 0.2 mm.

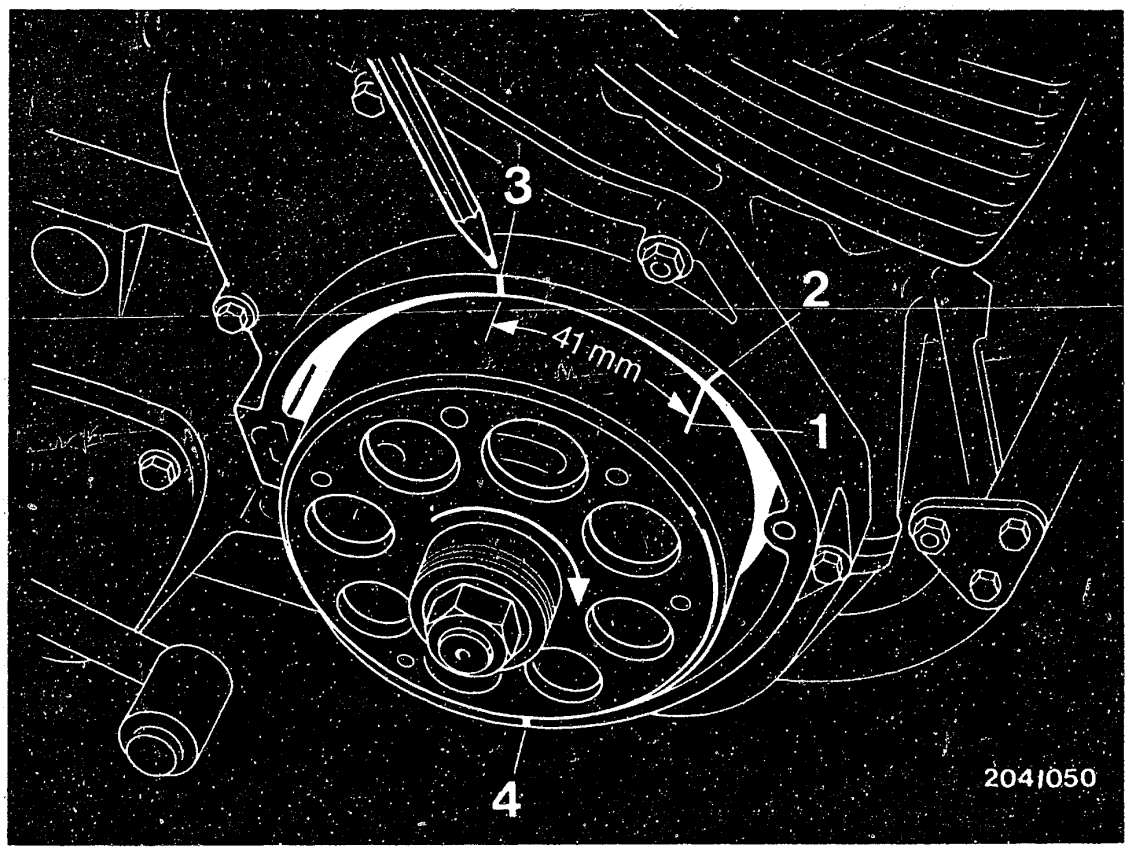
The ignition timing is adjusted by moving the same pulse generators, in direction of rotation = retard, or against direction of rotation = advance.
Adjust the ignition timing separately for each cylinder.



1 = Trigger projection before the jump
2 = Trigger projection after the jump
3 = Pulse generator

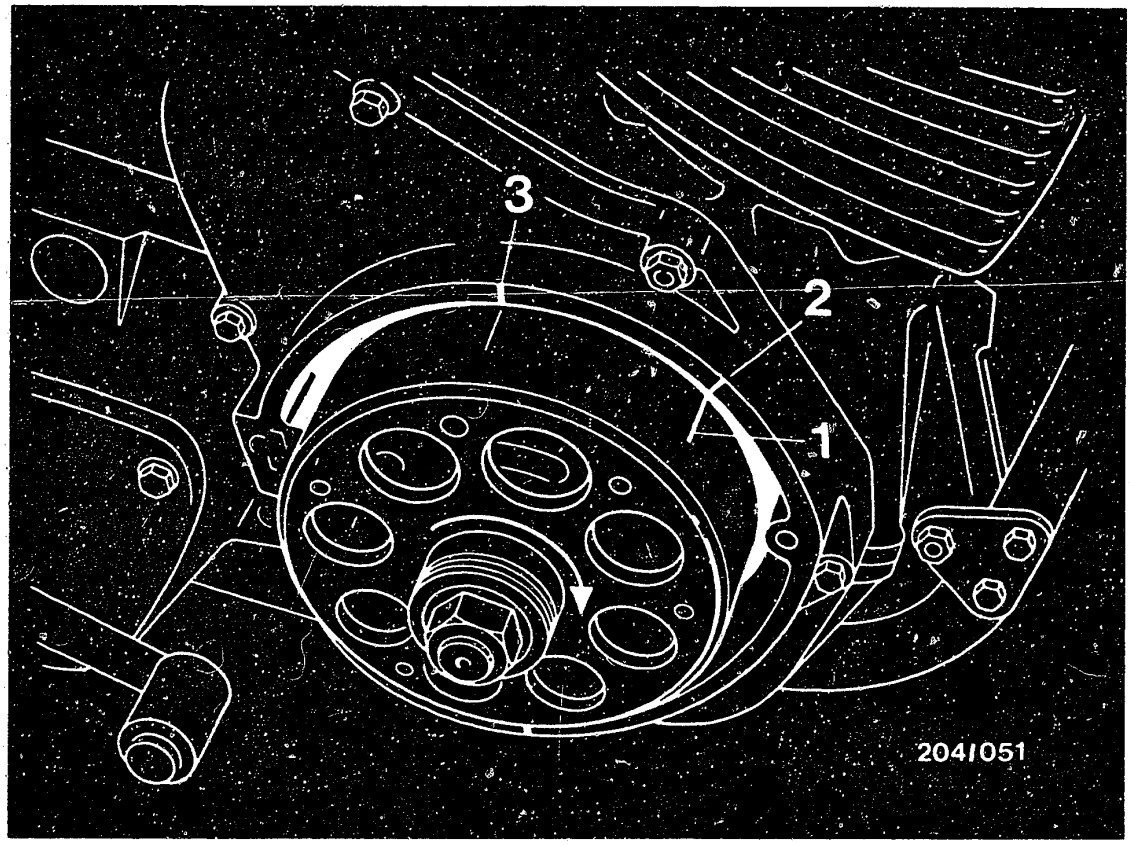
9.4 Testing and adjusting the jump advance on Laverda 500

Remove left-hand crankshaft housing cover. Start engine and aim timing light at control bushing. Between 1500 and 2500 min^{-1} the timing must undergo a jump advance (against the direction of rotation) of approx. 15° - 20°. Test the jump advance on each cylinder. It is possible to correct the jump advance by adjusting the air gap between pulse generator and control bushing.



9.5 Testing the ignition timing (static) on Laverda 1000 and 1200 with pulse generator on armature base plate

Remove ignition system closing cover on right-hand side of engine.
Turn pole wheel by hand until housing mark (2) and pole-wheel mark (1) are in alignment. Make new mark on pole wheel 41 mm away from pole-wheel mark (1) in a counterclockwise direction, and transfer mark to transmission housing (3).
At 180° to housing mark (3) make housing mark (4).
41 mm corresponds to 33° BTDC.

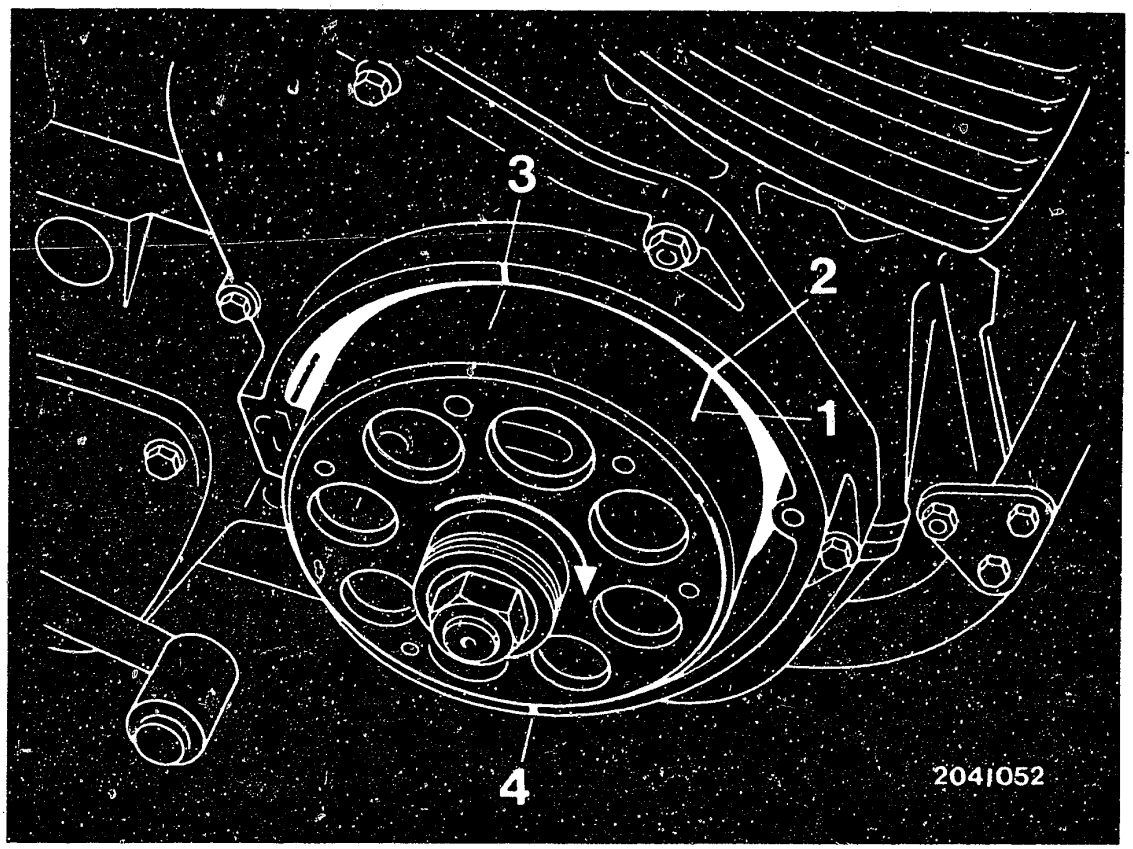


9.6 Testing the ignition timing (dynamic) on Laverda 1000/1200 with pulse generator on armature base plate

Connect timing light according to operating instructions. Fit clamp-on pickup over H.T. ignition cable of right-hand or left-hand cylinder. Start engine and allow to warm up.

Raise engine speed and flash timing light at mark. At 5000 min^{-1} the two marks (1) and (3) must come into alignment.

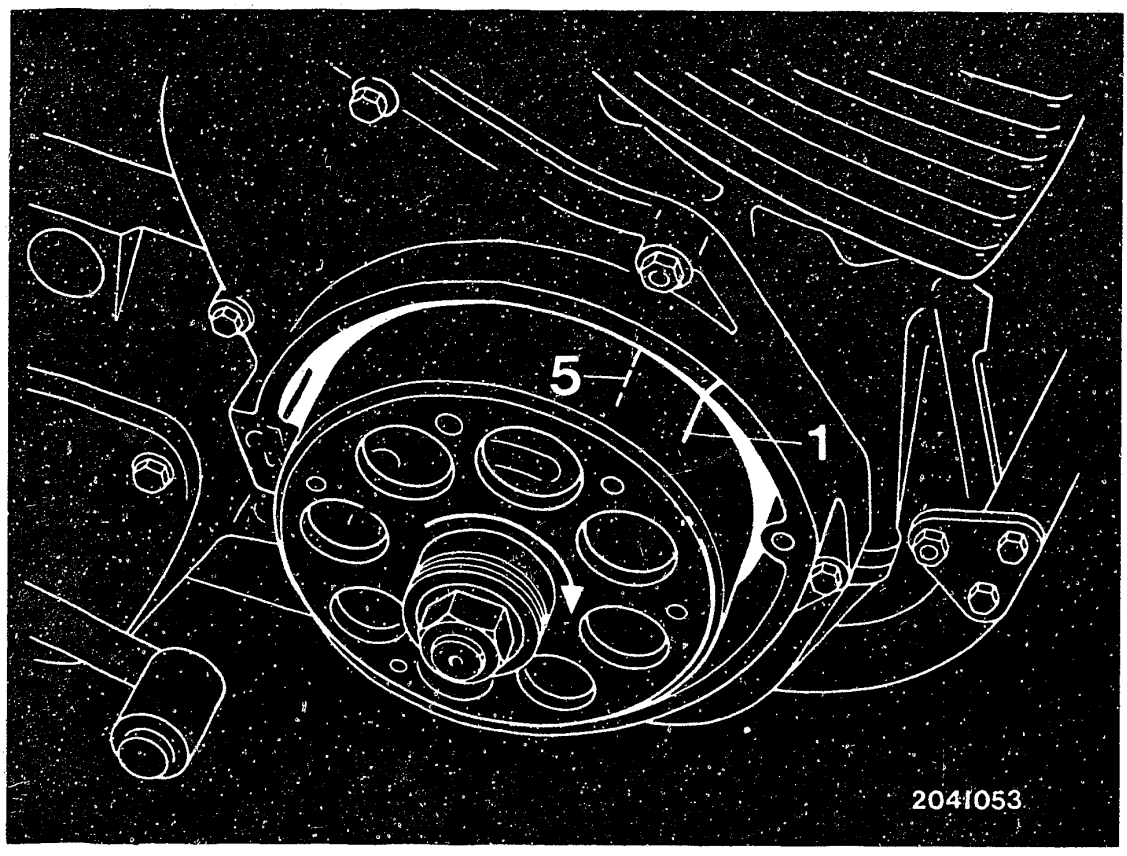
If there is too much retard the pole-wheel mark (1) appears to the right of the housing mark (3), and if there is too much advance it appears to the left of it.



9.7 Adjusting the ignition timing on Laverda 1000/1200 with pulse generator on armature base plate

The ignition system is corrected by turning the armature base plate.

If there is too much advance, turn armature base plate in clockwise direction. If too much retard, turn in counterclockwise direction. Then fit clamp-on pickup over ignition cable of center cylinder. Start engine and, at 5000 min^{-1}, flash timing light at marks (1) and (4). Marks must not be more than $\pm$ 2.5 mm apart.

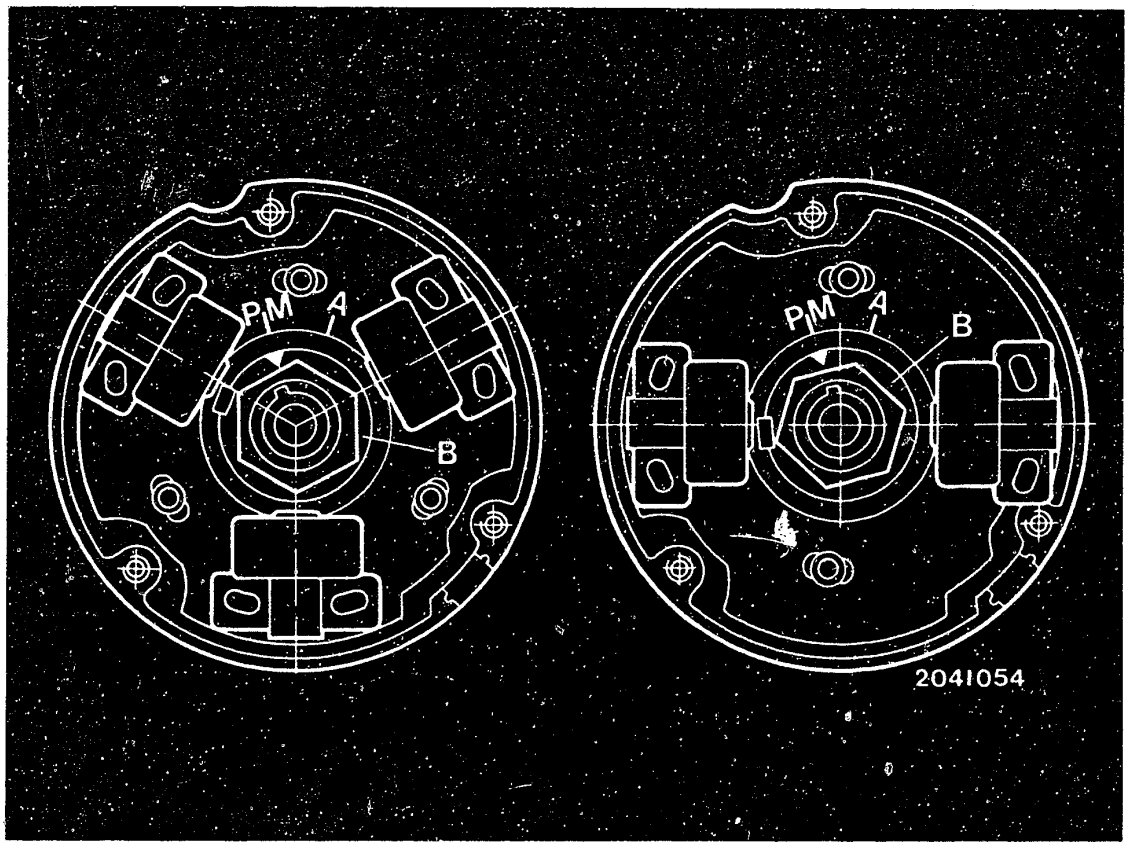


1 = Mark before the jump
5 = Mark after the jump

9.8 Testing the jump advance on Laverda 1000 and 1200 with pulse generator on armature base plate

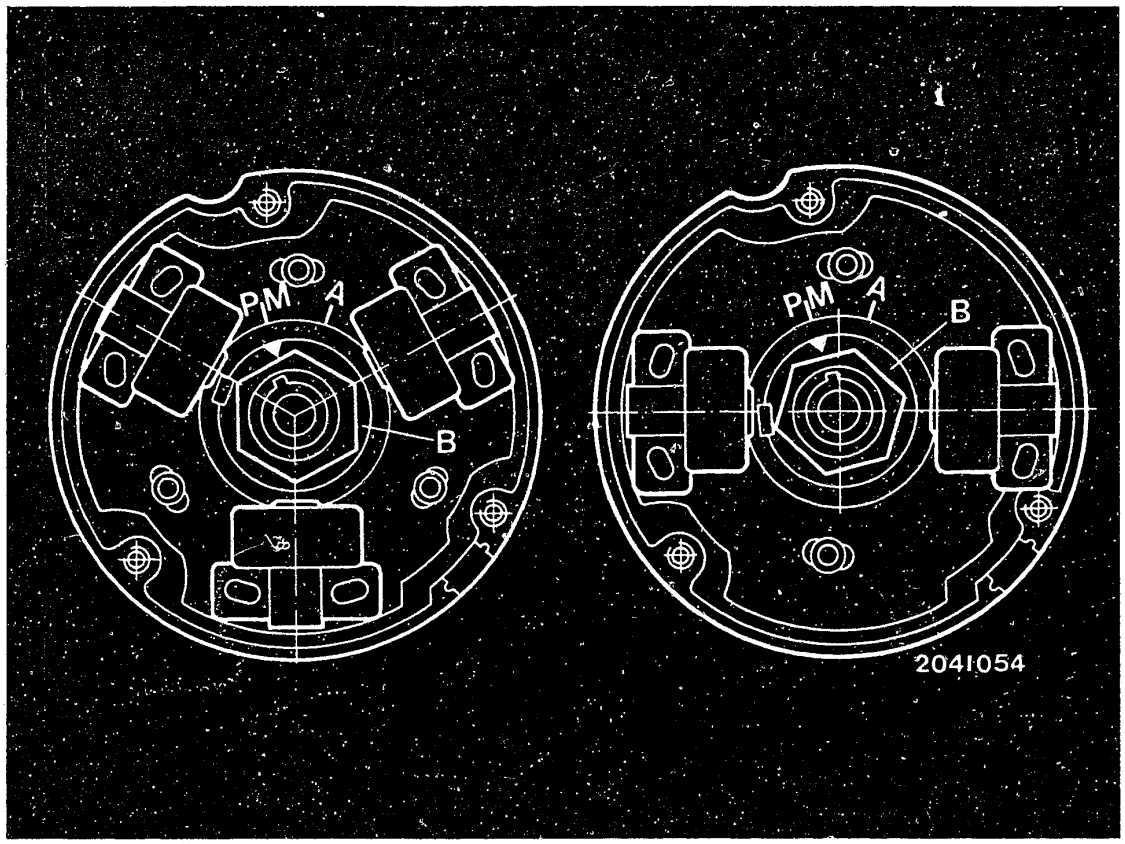
Between 1500 and 2500 min^{-1} there must be a jump advance (against the direction of rotation) of approx. 15° - 20°. Test the jump advance on each cylinder.

A correction of the jump advance is not possible (is determined by black box). It is possible only to replace the black box.

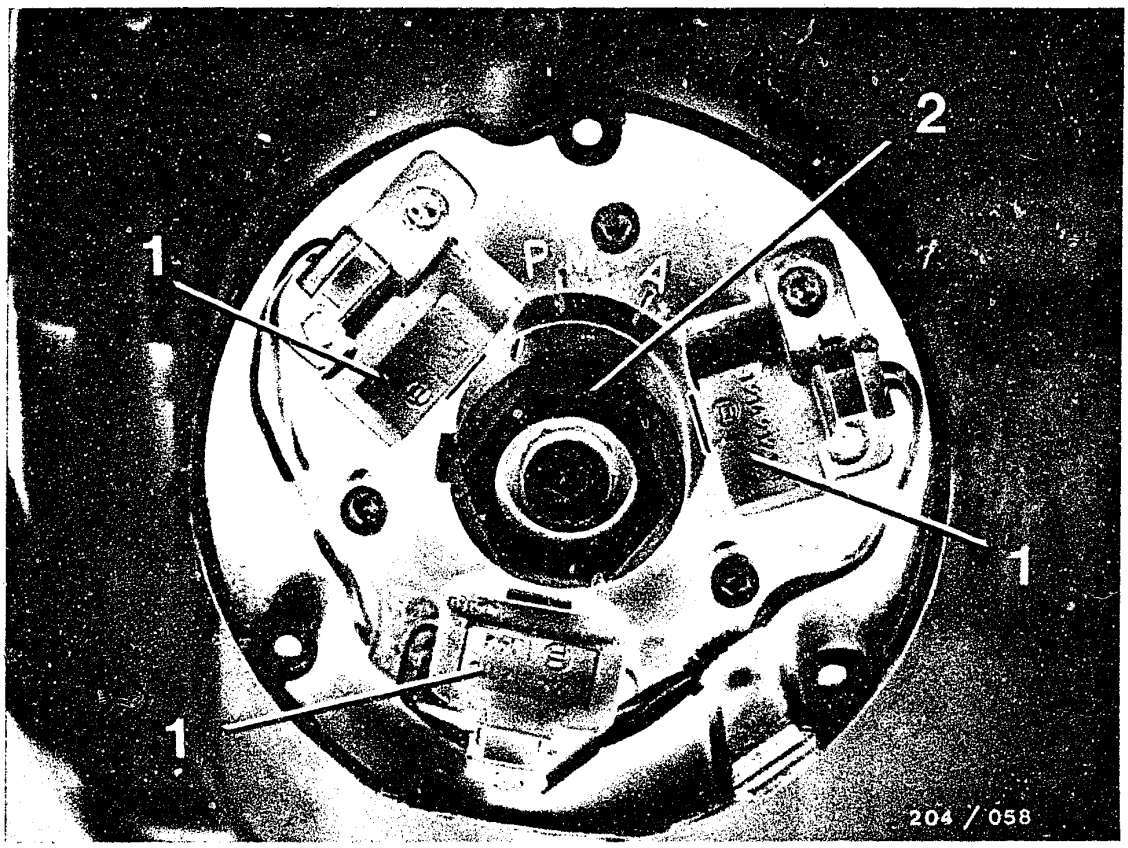


9.9 Ignition timing of Laverda 1000 and 1200 with 120° or 180° pulse generator configuration

Remove cover of left-hand crankshaft housing. On the pulse generator plate there are 2 line marks (A and PM). On the control bushing (B) there is 1 line mark (see picture).
Connect timing light according to operating instructions. Fit clamp-on pickup over one of the H.T. ignition cables.
Start engine and allow to warm up. Raise engine speed and flash timing light at marks.

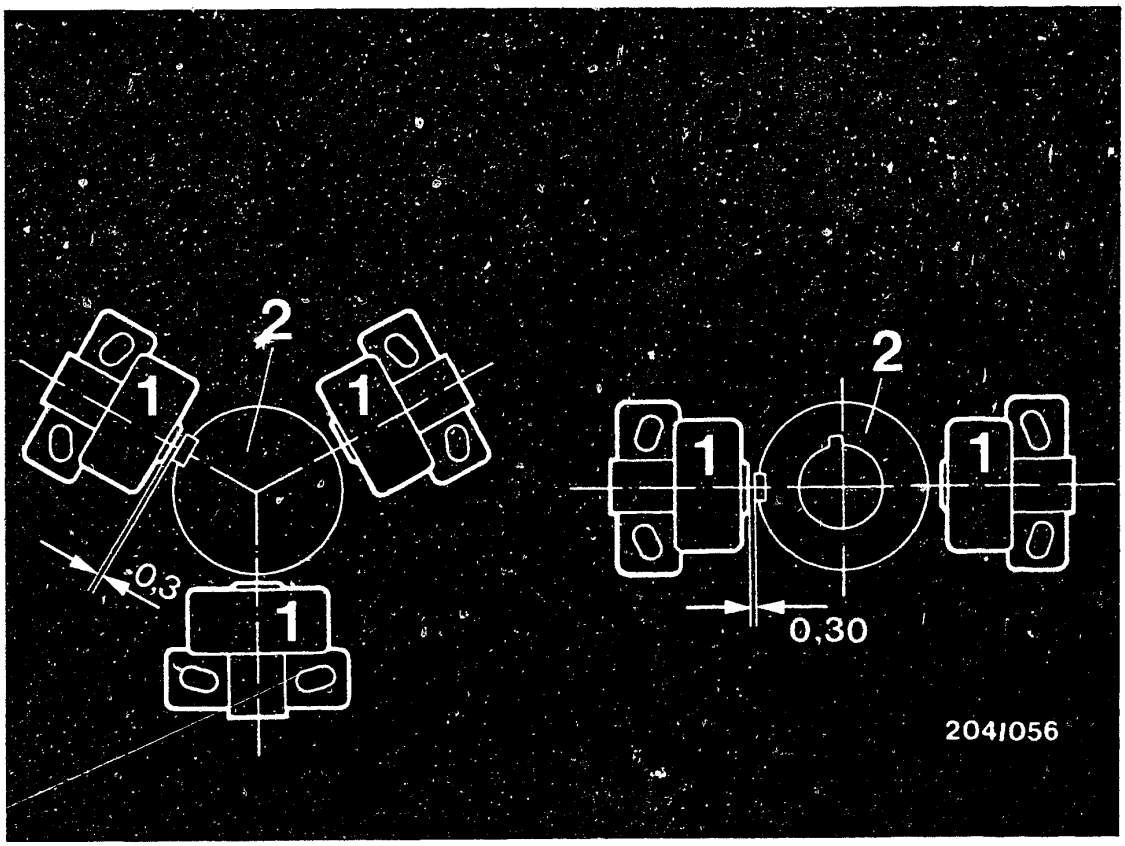


At 4000 min^{-1} the moving marks on control bushing (B) must come into alignment with the fixed mark (A) on the pulse generator plate.
If there is too much retard the mark on the control bushing appears to the right of housing mark A; if there is too much advance it appears to the left of housing mark A. Test the ignition timing separately for each cylinder.



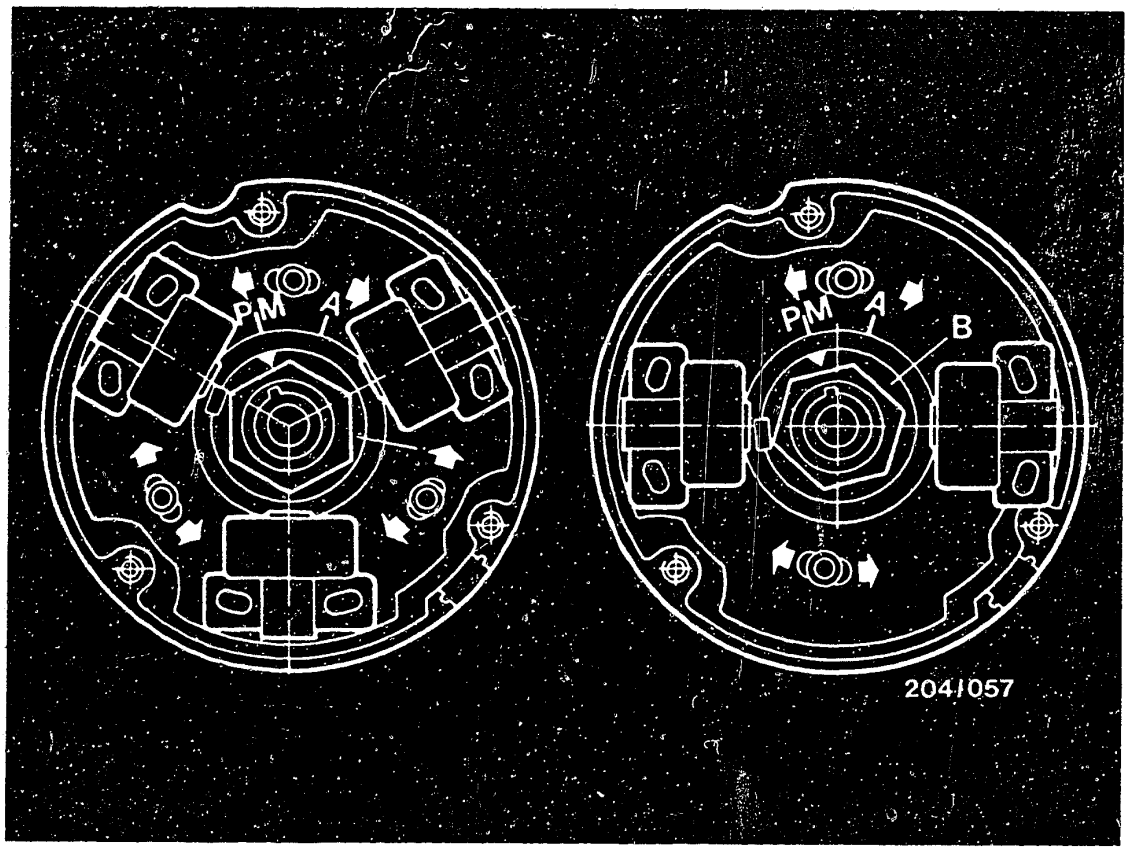
1 = Pulse generator, 120° configuration
2 = Control bushing with trigger projection

9.10 Adjusting the ignition timing on Laverda 1000 and 1200 with 120° or 180° pulse generator configuration

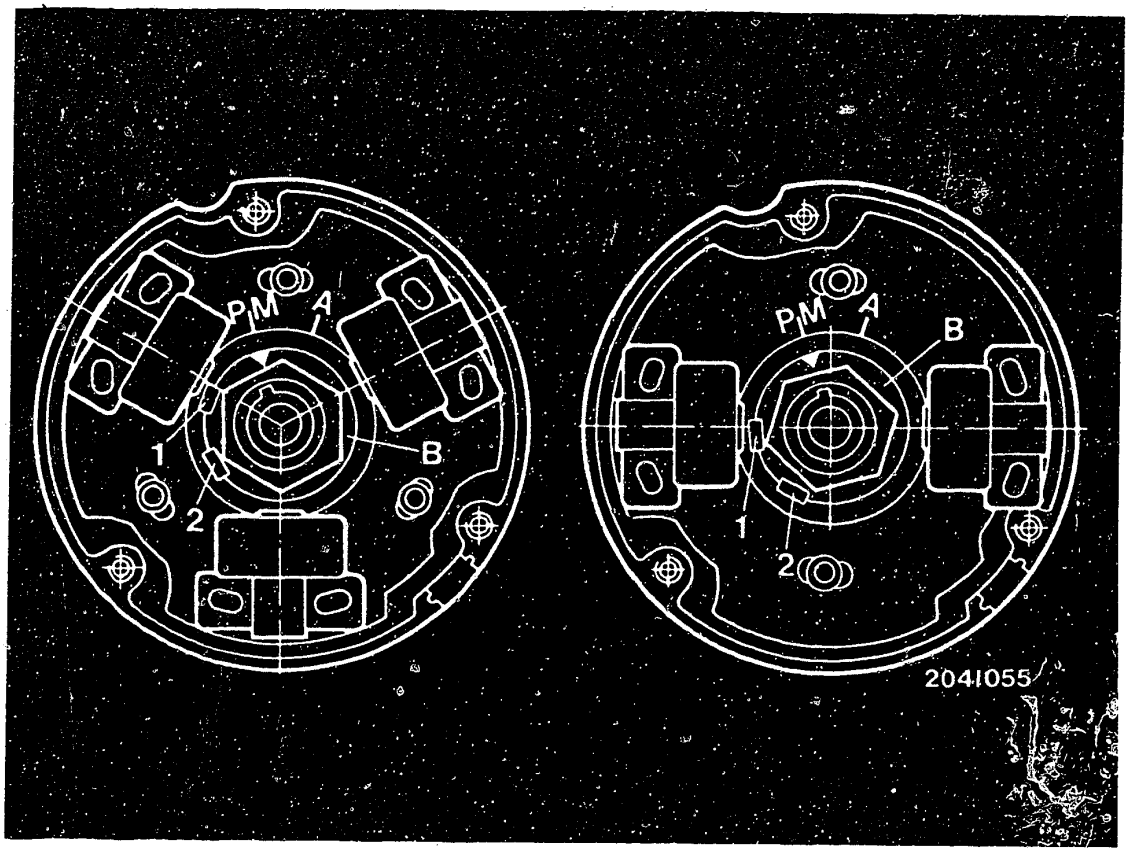


1 = Pulse generator 2 = Control bushing

Each adjusting of the ignition timing must be accompanied by a re-adjusting of the air gap between pulse generators and trigger projection on control bushing. This is done after loosening the fastening screws by moving the pulse generators in the direction of the crankshaft or away from it. The air gap should be 0.3 mm (see picture).
Set air gap at each pulse generator.



The ignition timing is adjusted by moving the pulse generator plate, in the direction of rotation = retard, against the direction of rotation = advance (see picture).



1 = Trigger projection before the jump
2 = Trigger projection after the jump

9.11 Testing and adjusting the jump advance on Laverda 1000 and 1200 with 120° or 180° pulse generator configuration

Start engine and flash timing light at control bushing. Between 1500 and 2500 min^{-1} there must be a jump advance (against the direction of rotation) of approx. 15° - 20°. Test the jump advance on each cylinder. It is possible to correct the jump advance by adjusting the air gap between pulse generator and control bushing.

After-sales Service

Technical Bulletin

VDT-I-204/100 B
4.1976

0 204..
Danger of accident with electronic magneto ignition systems for small-power engines

Please ensure that this technical bulletin is read by all your employees.

Increased demands made by modern small-power engines on ignition systems with regard to freedom from maintenance led some time ago to the series installation of electronic magneto ignition systems. Generally speaking, ignition power, particularly of the magneto capacitor-discharge ignition systems, is higher with nearly all engine manufacturers than the power attained with conventional ignition systems. Furtherincreases in power are still possible.

This will lead to the magneto capacitor-discharge systems in particular coming into a power range which will make it potentially lethal to touch parts or terminals under voltage (this applies primarily to the capacitor charging cable). In this regard we should like to point out that it is essential that the legal regulations prevailing in your country concerning work on H.T. systems be rigidly observed during all work and tests carried out on electronic ignition systems.

The engine should be switched off as a matter of principle during work on the magneto ignition system, for example when:

- repairing or exchanging parts of the ignition system (spark plug, ignition coil or armature, ignition cable, short-circuit switch, etc.).
- connecting ignition testing devices (timing light, magneto CDI tester, etc.).

If during checking of the ignition system or adjustment work on the engine (e.g. carburettor) it becomes necessary to switch on the ignition, then the lethal voltages mentioned above are present throughout the entire system.

Danger exists therefore not just when touching individual components of the ignition system (e.g. ignition coil or armature, trigger box, ignition harness) but also when touching the wiring harness (e.g. charging cable, diagnostic plug if fitted), the spark plug connectors and the testers.

Overleaf are some typical wiring diagrams of R and S semiconductor magneto ignition systems, in which the dangerous points are denoted with red H.T. arrows.

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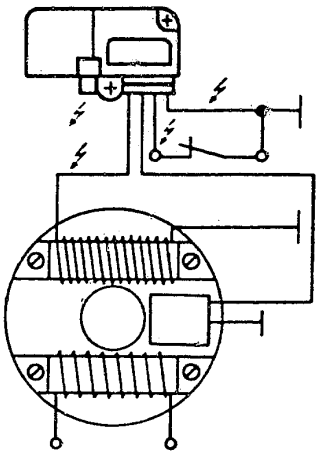

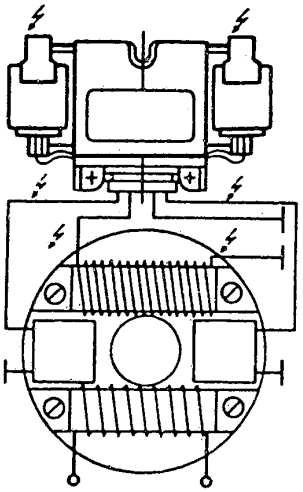

We should like to point out here that all semiconductor magneto ignition systems, even older ones , are dangerous in the sense defined by this bulletin.

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